3.9 a derivatives of exponential functions

$y = e^x$ $e \approx 2.718\ldots$

sketch $y' = e^x$

Oct 12-10:20 AM

$\frac{d}{dx} e^u = e^u \cdot \frac{du}{dx}$

$\frac{d}{dx} e^{x^2+x} = (2x+1)\, e^{x^2+x}$

do analytically, check with calc

$\frac{d}{dx} e^{\sin x} = \cos x\, e^{\sin x}$

Oct 12-10:26 AM

$\frac{d}{dx} e^{\sin^{-1}x} = \frac{1}{\sqrt{1-x^2}} \cdot e^{\sin^{-1}x}$

$\frac{d}{dx} e^x \tan^{-1}x = e^x \frac{1}{1+x^2} + \tan^{-1}x \cdot e^x$

$\frac{d}{dx} e^{x\tan^{-1}x} = \left(x \cdot \frac{1}{1+x^2} + \tan^{-1}x \cdot 1\right) \cdot e^{x\tan^{-1}x}$

in: $x\tan^{-1}x$ out: e^u

Oct 12-10:31 AM

$\frac{d}{dx} 2^x = ?$

$2^x = e^{x \ln 2} = e^{\ln 2^x}$

der

$\ln 2\, e^{x \ln 2} = \ln 2 \cdot 2^x$

Oct 12-10:39 AM

$\frac{d}{dx} a^u = a^u \ln a \frac{du}{dx}$

$\frac{d}{dx} 2^x = 2^x \ln 2 \cdot 1$

$\frac{d}{dx} 3^{(x^2)} = 2x \cdot 3^{x^2} \cdot \ln 3$

Oct 12-10:44 AM

Ex 2 at what point does the tan line to $y = 2^t - 3$ have a slope of 21?

$\frac{d}{dt} 2^t - 3 = 2^t \cdot \ln 2$

$\frac{dy}{dt} = 21$

$2^t \ln 2 = 21$ solve for t

$2^t = \frac{21}{\ln 2}$ $\ln \frac{a}{b} = \ln a - \ln b$

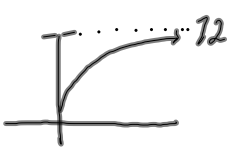
$\ln 2^t = \ln\left(\frac{21}{\ln 2}\right)$

$t \ln 2 = \ln 21 - \ln(\ln 2)$

$t = \frac{\ln 21 - \ln(\ln 2)}{\ln 2}$

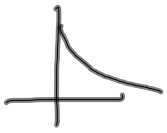
Oct 12-10:47 AM

$y = 72 - 30(.98)^t$



when is the milk warming fastest?

$y' = -30(.98^t)\ln(.98)$



biggest when $t = 0$

Oct 12-10:53 AM